

Science, partnerships, and persistence begin to restore lost marine ecosystems and fisheries at Channel Islands National Park

by Gary E. Davis

DURING THE 1980S AND 1990S, FISHING dramatically altered marine ecosystems in Channel Islands National Park, California, reversing nearly 30 years of National Park Service stewardship. Alarmed by more than two decades of scientific data showing declines in ocean vital signs in the park, the National Park Service and some experienced recreational fishers requested that the California Fish and Game Commission designate a network of reserves in the park. The purposes of the reserves were to rebuild populations of sea life depleted by fishing, to restore ecosystem integrity, and to sustain fisheries in the future. Four years of community negotiations and public hearings followed the request, culminating in 2002 in a commission decision to establish 10 marine reserves in and near the park (nine in park waters and one within a mile of the park). State regulations, scheduled to take effect in April 2003, create a network of 1,200- to 20,000-acre reserves, totaling nearly 75,000 acres, that will replenish depleted populations and preserve marine ecosystems for exploration, inspiration, and education.

"This generation must ... protect the integrity and resilience of ocean ecosystems by creating networks of fully protected marine reserves."

National Park Service stewardship of submerged resources at the Channel Islands began in 1949 with Channel Islands National Monument. Concern over declining populations of sea life led the National Park Service to curtail fishing in half of the monument in the 1960s. The number and size of lobster, abalone, and fish in the protected zones of the monument rapidly increased. When fished populations along the mainland coast and at other nearby islands began to decline sharply in the 1970s, a fisherman complained to the State of California that the ban prevented him from taking state-owned lobster. In 1978 the U.S. Supreme Court affirmed that California indeed owned the lobster in the monument by virtue of the 1953 Submerged Lands Act. The Court's decision eliminated 15 years of NPS protection, and fishing resumed under state control throughout the monument. Only a 37-acre portion of the Anacapa Island Ecological Reserve remained protected from fishing.

The California Channel Islands and surrounding waters have been recognized as special places by state designations as ecological reserve, nature reserve, area of special biological significance, and research natural area, and by federal designations as national park, national marine sanctuary, and biosphere reserve. Partnerships have been an essential part of conservation in this region for a long time. Congress created Channel Islands National Park in 1980 by expanding Channel Islands National Monument. The expansion explicitly added 119,000 acres of submerged lands and waters. This act ushered in a new era of state and federal cooperation at the islands. The National Park Service cooperated with the State of California and the U.S. Department of Commerce to implement a scientifically rigorous ecological monitoring program to measure changes in the health of the new park's island and marine ecosystems. More than 400 scientists from state and federal agencies and universities have helped to monitor and assess the health of kelp forests, rocky intertidal communities, beaches and lagoons, seabird colonies, and pinniped rookeries in the park over the past 24 years.

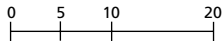
Monitoring revealed alarming changes in ecosystem health caused by fishing. For example, many species taken by fishing, such as pink abalone (*Haliotis corrugata*) and red sea urchin (*Strongylocentrotus franciscanus*), declined rapidly, whereas species not taken fluctuated normally with environmental conditions. Elsewhere, the only place where fished species persisted for a time was the protected portion of the Anacapa Island Ecological Reserve. Kelp, rockfish, abalone, and red sea urchin populations declined drastically. California closed fisheries or severely restricted them in the 1990s to prevent extinctions and encourage population recovery. White abalone (*Haliotis sorenseni*) was listed as the nation's first endangered marine invertebrate, a species whose center of distribution had been the Channel Islands.

The findings also indicated that fishing removed the large predators (such as California sheephead, rockfishes, and lobster) and competitors (such as red sea urchin and abalone) needed to hold hordes of small purple sea urchins (*Strongylocentrotus purpuratus*), brittle

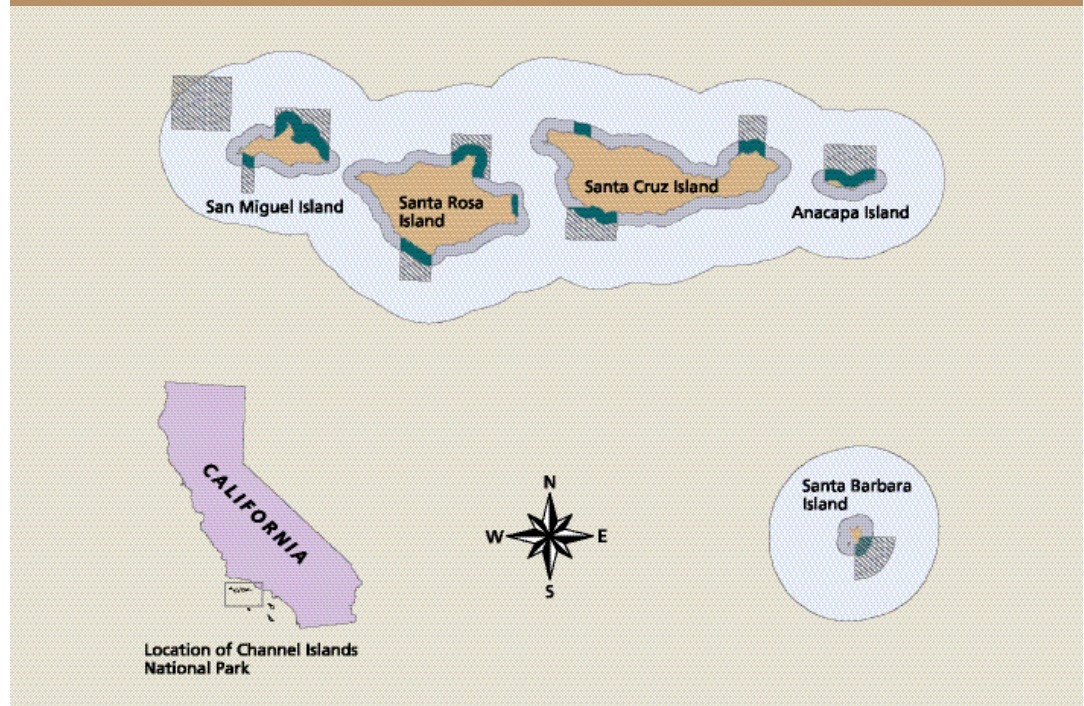
Legend

- Marine reserve boundary within park waters
- Marine reserve boundary outside park waters
- Island
- Extent of park waters
- Extent of Channel Islands National Marine Sanctuary waters

Miles



MARINE RESERVES, CHANNEL ISLANDS, CALIFORNIA



A new network of 10 fully protected marine reserves in Channel Islands National Park and Channel Islands National Marine Sanctuary will reverse a 20-year decline in kelp forest productivity and biodiversity and help sustain local fisheries.

stars (*Ophiothrix*), and sea cucumbers (*Cucumaria*) in check. Unconstrained, these species overgrazed reefs and kelp forests, excluded other species, and prevented young kelp plants from settling. Starvation and disease now control these species, resulting in wild boom-and-bust cycles.

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Monitoring also revealed that marine systems were much less resilient to natural disturbances after years of fishing. Storms associated with major El Niño events opened holes in kelp forest canopies. At most sites the canopy recovered a few years after storms, but after each event, purple sea urchins and brittle stars overran a few more areas. By 1999 nearly 80% of the kelp forest in the park was gone. Without kelp as food and shelter, depleted abalone and red sea urchin populations could not recover. In the “urchin barrens,” areas overrun with purple urchins and brittle stars, fewer than 200 of the 1,000 species found in healthy kelp forests remained.

In addition, persistent organic compounds, such as DDT and PCBs, contaminate marine food webs, stressing fish and wildlife. The relative effects of pollution and fishing were revealed by comparing populations in areas affected by both fishing and pollution with populations in the protected area in the reserve. In the reserve, which was bathed in polluted water but free of fishing, kelp forests remained intact and large predators survived and kept other species in check. In other words, the reserve’s kelp forests were resilient. They recovered quickly after storms and El Niño events, providing a thousand species with food and shelter. From these observations it was clear that fishing impaired the park’s balanced, healthy ecosystem.

Monitoring vital signs of kelp forests in the park and recent advances in ecology revealed fatal flaws in conservation strategies. In the past, fishery scientists thought that the high potential reproductive capacity of older, mature fish was surplus to the needs of the species. For this reason managers believed that fisheries could be sustained by harvesting all the big fish and leaving only young fish to reproduce. Today it is clear that many species need the huge reproductive capacity of old fish to exploit opportunities for population gains provided by rare, extreme environmental events and to overcome predators and competitors. This need has become more evident as technology has advanced.

“State regulations ... create a network of ... reserves ... that will replenish depleted populations and preserve marine ecosystems for exploration, inspiration, and education.”

Although it was unknown in the past, remote and isolated patches of habitat at the islands provided refuge for old fish, which sustained fishing elsewhere. Modern technology, including fast boats with electronic fish finders and satellite navigation, eliminated these important havens by giving people access to even the most remote reefs and underwater canyons where remnant populations of large, old fish survived.

Research has shed new light on the complex functioning of marine ecosystems. Interactions among species are powerful forces that bind components of ecosystems together, but fishing removes selected species and dissolves those bonds. Fishing caused unintended consequences that cascaded through the park for decades and reduced productivity and biodiversity. To restore and sustain ecosystems and to support fisheries, the latest understanding of marine species and ecosystems must be applied to the development of conservation strategies that are based on ecosystems rather than on individual species.

To ensure that the people who follow us have opportunities to enjoy the sea’s bounty—not

only the wealth of food it provides but also its enduring beauty and inspiration—this generation must explicitly protect the integrity and resilience of ocean ecosystems by creating networks of fully protected marine reserves. Only in this way can we restore the fishing-weakened ecological interactions upon which resilient marine ecosystems depend, reestablish the lost reproductive capacity of depleted species, and provide insurance against human ignorance and arrogance. The new reserve network in Channel Islands National Park is a good beginning. ■

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Giant kelp can grow 2 feet a day and forms towering forests more than 100 feet tall that harbor nearly 1,000 species of fish, invertebrates, and algae on rocky reefs in the cool, clear water around the California Channel Islands. The new network of 10 fully protected marine reserves in the national park and Channel Islands National Marine Sanctuary will reverse a 20-year decline in kelp forest productivity and biodiversity and help sustain local fisheries.



NPS PHOTO BY DAN RICHARDS